Final Overspeed 4320RPM for 5 minutes.

****************************************

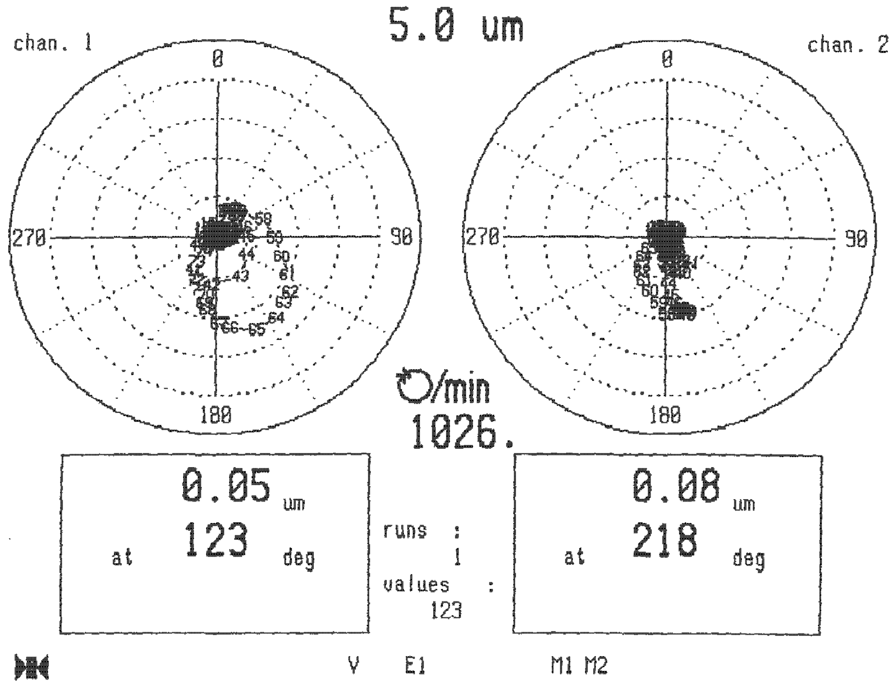
ALSTOM Test Engineer : N.Armstrong

Power

Rugby G.B.

****************************************

operator : N.ARMSTRONG 03.12.02 10:17




1/1 DEC 4, 2002

IP7008504

Final Overspeed 4320RPM for 5 minutes.

****************************************

ALSTOM Test Engineer : N. Armstrong

Power

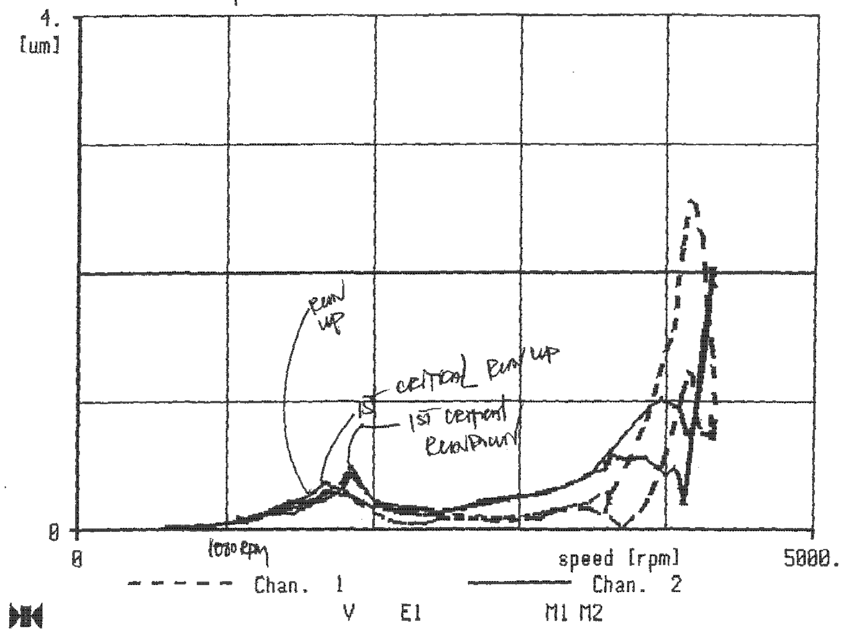
Rugby G.B.

****************************************

operator : N.ARMSTRONG 03.12.02 10:18

file name : INTERMOUNTAIN 1HP HS

vibration displacement rotor : RF113218.




Ul DEC 4, 2002

IP7008505

After Final Overspeed 4320 RPM for 5 minutes.

****************************************

ALSTOM Test Engineer : N. Armstrong

Power

Rugby G.B.

****************************************

operator : N.ARMSTRONG 03.12.02 10:23

| | | |
|---|---|---|
| rotor data | setup 1 | INTERMOUNTAIN 1 HP |
| a: 1950. mm | b: 2129. mm | c: 1204. mm |
| r1: 309.0 mm | 2-plane | r2: 313.0 mm |
| m1: +polar | | m2: +polar |
| tol1: 24.00 kgmm | | tol2: 24.00 kgmm |
| | set speed : 600. rpm | |
| readout | rotor: RF113218 | 03.12.02 10:23 |
| run 1 | act speed : 600. rpm | |

pl 1: 23.0 g — 168. deg — in tol

pl 2: 9.67 g — 142. deg — in tol

correction in tol. units :

7.097 kgmm 3.025 kgmm

U1 Dec 4 2002

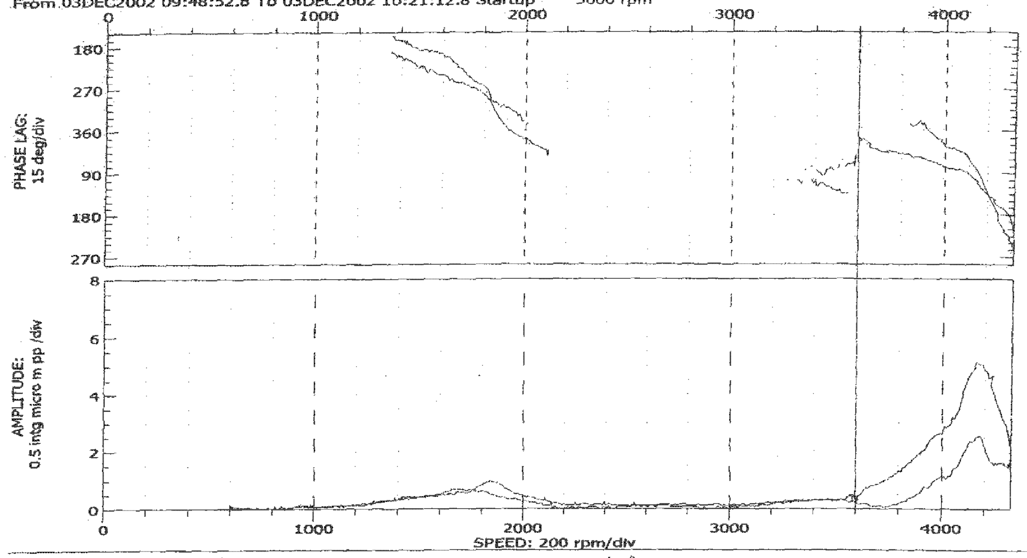
IP7008506

U1 DEC 4, 2002

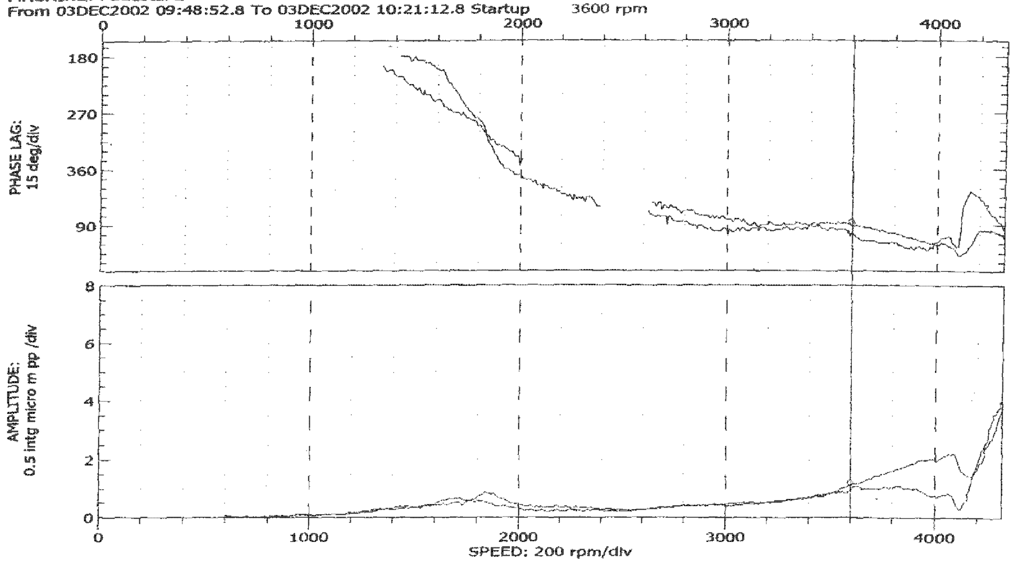
BODE PLOT
COMPANY: GEC Alsthom T/G Ltd
MACHINE TRAIN: INTERMOUNTAIN 1 HP

PLOT NO.______
PLANT: Rugby Overspeed
JOB REFERENCE: 761R0529/02/103/006

POINT: Schenck ∠180° 1X UNCOMP 0.233∠NA°
MACHINE: Pedestal 1
From 03DEC2002 09:48:52.8 To 03DEC2002 10:21:12.8 Startup 3600 rpm




POINT: Schenck ∠180° 1X UNCOMP 1.09∠90°
MACHINE: Pedestal 2
From 03DEC2002 09:48:52.8 To 03DEC2002 10:21:12.8 Startup 3600 rpm




COMMENTS

Final Overspeed Run to 4320 RPM for 5 minutes

BENTLY NEVADA

IP7008507

U1 DEC 4 2002

ALSTOM
Turbine Generators Limited
Newbold Road
Rugby
Warwickshire
CV21 2NH

# CLOCK READINGS FOR ROTOR TRUTH CHECK

READINGS TAKEN LOOKING FROM FRONT TO REAR,
USING ROTOR DATUM "O" AS 12 O'CLOCK.

MACHINED ROTOR WEIGHT:-

STATION :-

TEST No. :-

CONTRACT:- INTERMOUNTAIN HP ROTOR , UNIT 1 ROTOR RUN OUT

INSPECTOR :-

DWG No. :- R201/3249

DATE :-

IP7008508

## High Speed Dynamic Balancing

The high speed dynamic balancing was completed twice, with five minutes over-speed intervals, on the Unit 1 HP completed bladed rotor. The rotor went through the 1st critical (1930 rpm) and 2nd critical (4170 rpm) speeds with exceptionally low vibration. The maximum peak-to-peak displacement vibration is 3.6 micro inches (0.0002"), better than that of the U2's HP (13.6 micro inches.) The Alstom maximum acceptable is 16.0 micro inches and GE maximum acceptable is 25.0 micro inches. Refer to the Table 1 and attached graphs.

| | Vibration, Displacement, Peak-to-Peak | | |
|---|---|---|---|
| Speed, rpm | HP Rear, in | HP Front, in | Comment |
| 1850 | 0.00002 | 0.00002 | |
| 3600 | 0.00001 | 0.00004 | |
| 3960 | 0.00010 | 0.00008 | |
| 4170 | 0.00020 | 0.00005 | |
| 4320 | 0.00007 | 0.00015 | |

## Rotor Run Out

All rotor's run out dimensions are found to be better than the limits. Refer to the attached drawing.

**From:** <gary.randle@power.alstom.com>
**To:** <PHONG-D@ipsc.com>
**Date:** 2/24/03 3:39AM
**Subject:** INTERMOUNTAIN 1 ROTOR OVERSPEED

Hi,

As requested please find attached the report from the Overspeed test on the Intermountain 1 Rotor.

(See attached file: IntMt1RotOS.TIF)

Sorry for the delay.

Regards

Gary



**CC:** <kevin.spires@power.alstom.com>

αβχδ

TSREG Module Design Group
Engineer: **R Cunningham**
Date: **14/01/04**

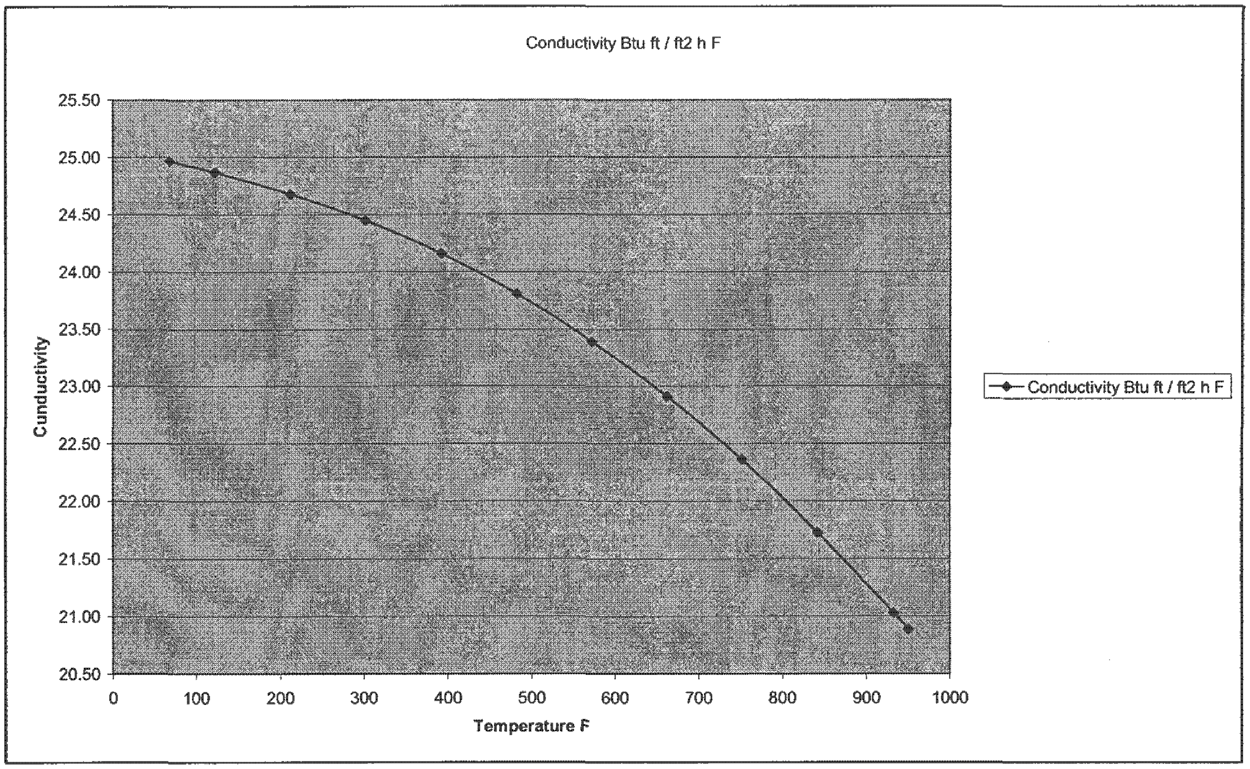
## Intermountain HP Rotor

**Item 1. HP Rotor Geometry**

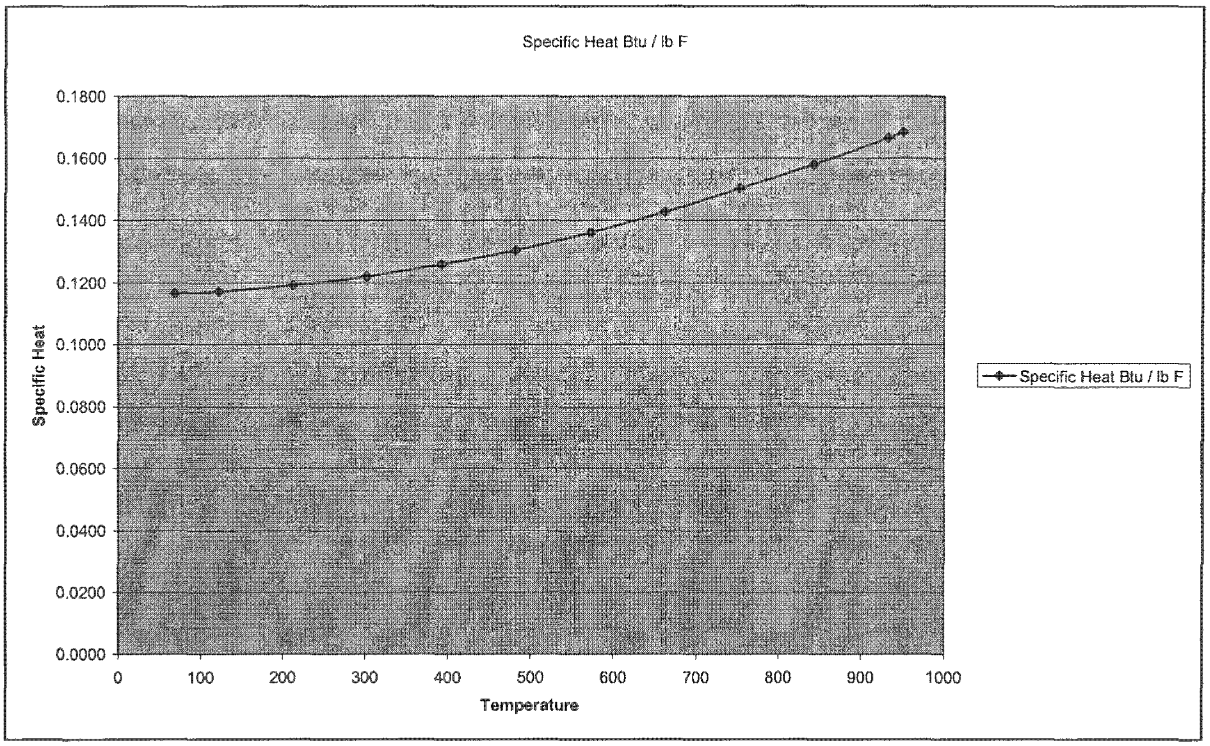
Diameter of HP Rotor at inlet gland 29.882”

**Items 1 to 9 Material Property Data**

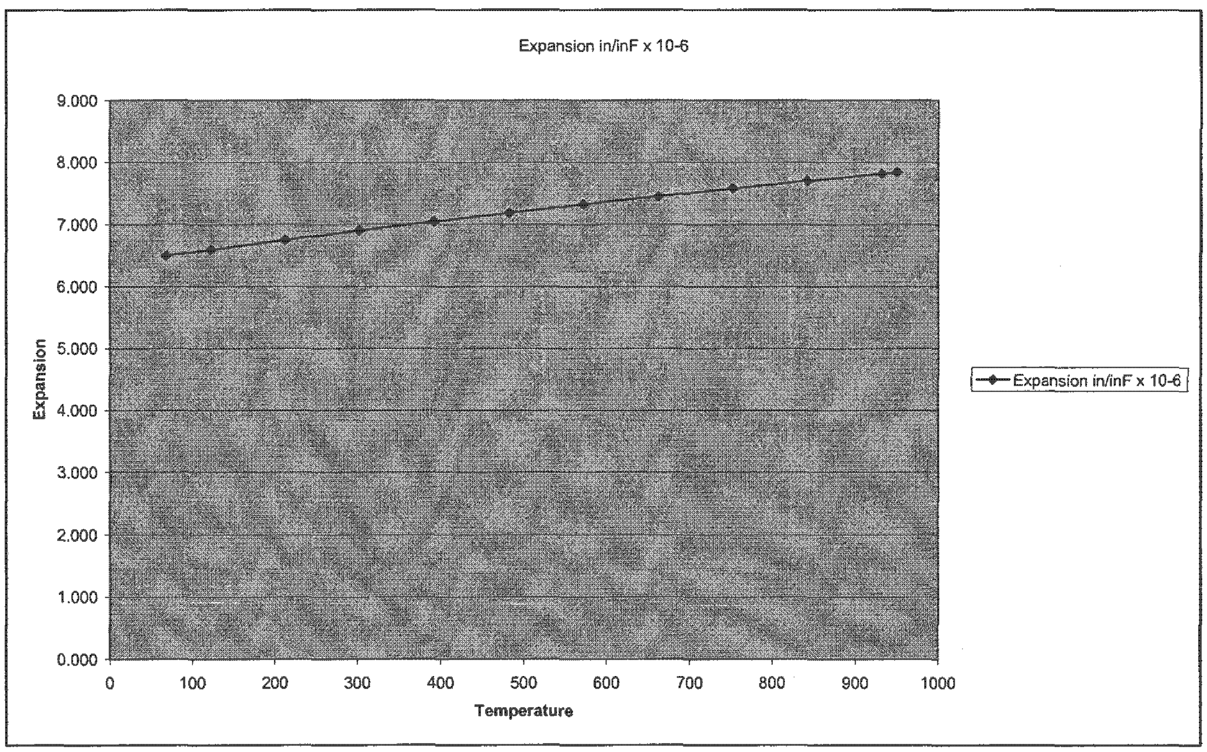
**Item 2. Thermal Conductivity**



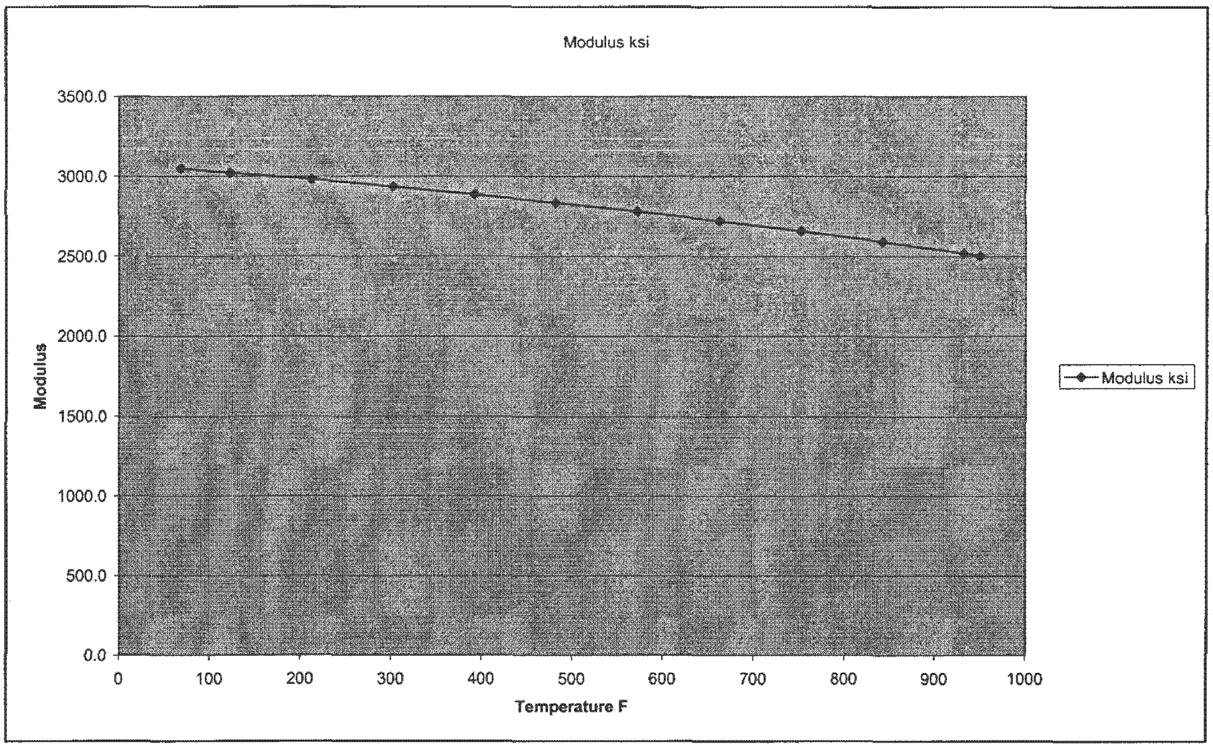
**Item 3. Specific Heat Capacity**



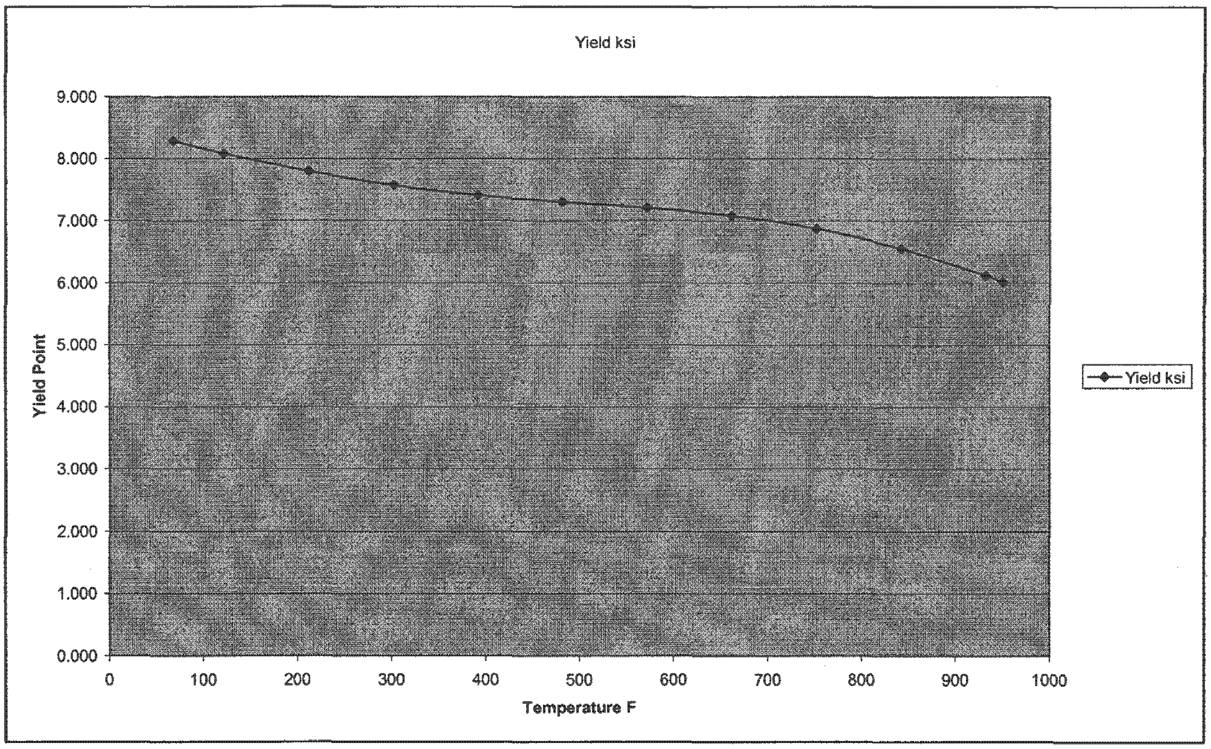

**Item 4. Thermal Expansion Coefficient**



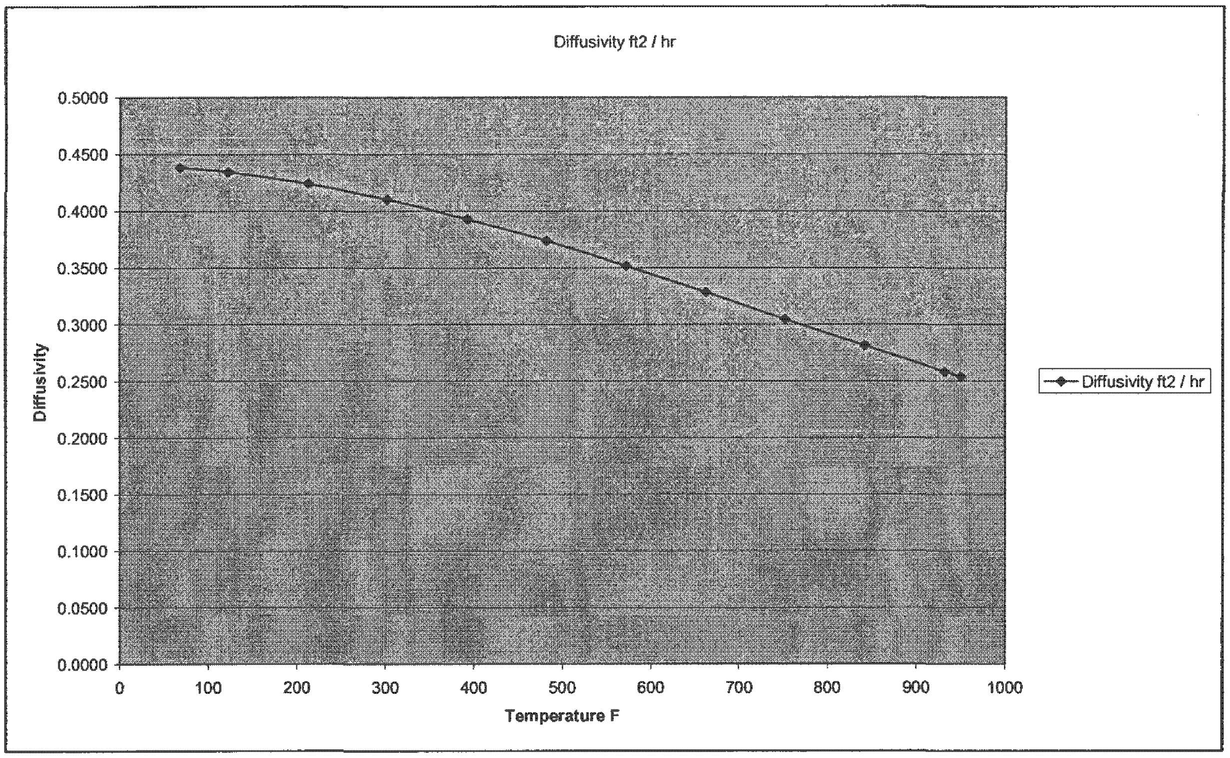
**Item 5. Young Modulus of Elasticity**




**Item 6. Yield Point**



**Item 7. Thermal Diffusivity**




**Item 8. Density of Material**

Density = 489 lbs/ft$^3$

**Item 9. Poisson's Ratio**

Ratio = 0.3

**From:** <wally.falconer@power.alstom.com>
**To:** "Phong Do" <PHONG-D@ipsc.com>
**Date:** 3/5/03 4:53PM
**Subject:** Intermountain Unit 1 exhaust gland - Ref I1/01

Phong

The interface drawing has now been modified to show the corrected coordinate for the exhaust packing head profile.

All sheets are updated to revision D

Wally

---------------------- Forwarded by Wally FALCONER/GBRUG01/Power/ALSTOM on 05/03/2003 22:58 ---------------------------

Robert CUNNINGHAM
05/03/2003 16:41

To: Wally FALCONER/GBRUG01/Power/ALSTOM@GA, Co-ordinator TECHNICAL-SERVICES/GBRUG01/Power/ALSTOM@GA
cc: RUGWW.TEGMail@GA, Kevin SPIRES/GBRUG01/Power/ALSTOM@GA

Subject: Intermountain Unit 1 exhaust gland - Ref I1/01

Hello Wally

Please find attached Issue D of the Interface Drawing (R202/A0/5396) with the exhaust gland modifications.

(See attached file: R202_A0_5396_D_EN_001.TIF)(See attached file: R202_A0_5396_D_EN_002.TIF)(See attached file: R202_A0_5396_D_EN_003.TIF)(See attached file: R202_A0_5396_D_EN_004.TIF)(See attached file: R202_A0_5396_D_EN_005.TIF)(See attached file: R202_A0_5396_D_EN_006.TIF)

Regards

Rob C

store or copy the information in any medium.

**From:** <robert.cunningham@power.alstom.com>
**To:** "Phong Do" <PHONG-D@ipsc.com>
**Date:** 1/24/03 8:27AM
**Subject:** Re: INTERMOUNTAIN Shell Thermo Couple

Hello Phong

Alstom Recommendations for Thermocouple Locations (Outer Shell Mid Wall)

The function of the outer casing top and bottom mid-wall thermocouples are to measure the top to bottom temperature differential. The OEM startup procedure limits this to 80deg F, which Alstom agrees with.

We recommend that you find an area on the top and bottom of the outer casing shell at the same length along the casing, away from bosses and heaters, prefeably on the vertical centreline. If this can not be achieved , then you can rotate the thermocouples off the centre line as long as you keep the angle the same (max of 15 deg from the vertical) and on the same side.

The bottom of the hole should be approximately in the middle of the shell.

The tapping details can be the same as on the inlet thermocouples (R202/A0/10325).

Please find attached some sketches to help you.

| | |
|---|---|
| Hole bottom to be in the middle of the wall section. If you have to rotate the drilling off the vertical centreline then keep the angle the same (top to bottom) and locate both thermocouples on the same side of the machine. Maximum angle of centreline 15 deg. Shown at approx 5 deg of vertical centreline. | (See attached file: INT_SECTION.tif) |
| Our guide would be to position the thermocouples between 34 to 35" from inlets. However if you and Wally can agree on a better position (due to features that I am unaware of please do so). | (See attached file: INT_position.tif) |

Regards

Rob C

"Phong Do" <PHONG-D@ipsc.com> on 22/01/2003 18:43:33

To: Robert CUNNINGHAM/GBRUG01/Power/ALSTOM@GA
cc: "Bill Morgan" <BILL-M@ipsc.com>, "Jim Knapp" <JIM-KNAPP@ipsc.com>, "James Nelson" <JIM-N@ipsc.com>, "John Fritzges" <JOHN-F@ipsc.com>, Alan HOLMES/GBRUG01/Power/ALSTOM@GA, Kevin SPIRES/GBRUG01/Power/ALSTOM@GA, Wally FALCONER/GBRUG01/Power/ALSTOM@GA

Subject: Shell Thermo Couple

Dear Rob,
Please provide info & drawing regarding the HP outer shell thermocouple installation.

Last year we install two temporary thermocouples on the HP outer shell, 1 on the upper half and other on the lower half, about 1/3 of the shell length relative to the front end. The thermocouples provide critical startup shell temperatures to ensure an acceptable thermal growth of the shell. Due to the short notice, we welded the two thermal pads (about 1" square) on the shell. This installation method may not provide a most accurate info.

I understand that Alstom has a better method of installing the shell thermocouple, ie, drill, tap the shell and install the thermocouple about 1/2 of the shell thickness...

Rob, please provide recommendations and drawings.

Thanks.

**CC:** "James Nelson" <JIM-N@ipsc.com>, <alan.holmes@power.alstom.com>, <kevin.spires@power.alstom.com>, <wally.falconer@power.alstom.com>, <adrian.bramley@power.alstom.com>, <RUGWW.TEGMail@test.alstom.com>

**IP7008518**

**From:** <kevin.spires@power.alstom.com>
**To:** <JIM-N@ipsc.com>
**Date:** 8/1/02 7:20AM
**Subject:** Intermountain Unit 1 Performance

Lets try this, I have tried about 4 times with James-n@ipsc.com
---------------------- Forwarded by Kevin SPIRES/GBRUG01/Power/ALSTOM on 01/08/2002 14:03 ---------------------------

Kevin SPIRES
01/08/2002 14:03

To: JAMES-N@ipsc.com
cc: PHONG-D@ipsc.com

Subject: Intermountain Unit 1 Performance

Hello James / Phong

Further to our telephone conversation yesterday I confirm we have put in hand all necessary work to reduce flow on Unit 1 by 1% as agreed.

This will involve us in a fair amount of re-engineering work and if we can get this to the factory by the end of next week or early the week after then we should be able to maintain the current works programme as I have already had the works put Stages 1 & 6 to the back of the manufacturing queue.

What I could really do with is official notification from IPSC that this is what you want us to do. If you could fax a confirmatory letter to Bill Eisma (with perhaps a silent copy to me 44 1788 531532) I would really appreciate it.

I have just tracked down a copy of the contract and will now start to read through to see what commercial implications there might be and will try and call you later to discuss.

Many thanks

Kevin

CONFIDENTIALITY:
This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose, or store or copy the information in any medium.

CONFIDENTIALITY:
This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose, or store or copy the information in any medium.

CONFIDENTIALITY:
This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose, or store or copy the information in any medium.

CONFIDENTIALITY:

ALSTOM

**MEMORANDUM**

**Power**
Steam Turbines

To: Adrian Bramley
Project Manager, Rugby

cc: Phil Kearney/ File

From: Joyce Moore
STRGT, Rugby

Date: 24th July 2002

**Subject: Intermountain- HP heaters out of service**

In response to James Nelson's e-mail (dated 12th July 2002), regarding the ability of the Intermountain turbines to tolerate short term operation with HP heaters isolated, a variety of scenarios were assessed. These scenarios were as follows:

1) One HP heater string isolated
2) All 6 HP heaters isolated
3) One top HP heater (e.g. heater 8b) isolated
4) Both top HP heaters isolated
5) One HP 7 heater isolated
6) Both HP 7 heaters isolated
7) One HP 6 heater isolated
8) Both HP 6 heaters isolated

In addition to determining the LP turbine exhaust flow under these conditions (as was requested), the heater pressures on the steam side of all heaters and the IP exhaust pressure were calculated. The heater pressures were then checked against the design pressures.

The IP exhaust pressure gives an indication of the loading on the latter stages of the IP turbine as well as on the LP turbine stages. This pressure was compared to that given by the predicted performance of the cycle with VWO (see drawing no. TS29247). From Test 8 carried out by PGT in April 2002, it can be seen that the turbines have been run under conditions very similar to those shown on TS29247. This shows the ability of the turbines to tolerate these conditions, although the IP exhaust pressure achieved (137.2 psia) is higher than that previously indicated on the OEM 5% O/P heat balance diagram. (Note: Units 1 & 2 turbines have previously operated at very similar pressure levels during BMCR tests in 1998)

The results showed that under all conditions, the LP exhaust loading was below the design limit of 15,000 lb/ft$^2$ per exhaust. Heater pressures also fell within design with



IP7008522

**Power**
Steam Turbines

the exception of the deaerator exceeding its design limit when all 6 HP heaters were isolated at throttle valves wide open (VWO). In all scenarios at VWO however, the IP exhaust pressure exceeded 137.2 psia. Further calculations were carried out in order to find the power output to which the turbines must be limited in order to reduce the IP exhaust pressure a value of 137.2 psia (the maximum normal operating pressure with all heaters in service- subject to review by IPSC/GE).

As a result of the analysis, it is advised that the generator output should be limited to the following when any of the HP heaters are tripped:

| | |
|---|---|
| 1) One HP heater string isolated | 923MW |
| 2) All 6 HP heaters isolated | 870MW |
| 3) One top HP heater isolated | 956MW |
| 4) Both top HP heaters isolated | 942MW |
| 5) One HP 7 heater isolated | 962MW |
| 6) Both HP 7 heaters isolated | 952MW |
| 7) One HP 6 heater isolated | 969MW |
| 8) Both HP 6 heaters isolated | 965MW |

In order to operate at higher loads, it is recommended that IPSC contact GE in order to obtain the maximum allowable conditions for safe operation of the IP and LP turbines.

Joyce Moore

a b c d

ALSTOM HBD

# Intermountain Units 1 and 2
## Results of Heat Balance with HP Heaters Isolated

Comparison of pressures with HP heaters isolated

| Heater No. | [illegible] pressure (psia) | [illegible] | [redacted] | One Heater 5 String Isolated |  | Top 6 Heaters Isolated |  | One Top Heater Isolated |  | Both top heaters isolated |  | One HP 7 heater isolated |  | Both HP 7 heaters isolated |  | One HP 6 heater isolated |  | Both HP 6 heaters isolated |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling |
| 1 | [illegible] | [illegible] |  | 5.6 | 5.2 | 6.3 | 5.2 | 5.3 | 5.2 | 5.5 | 5.2 | 5.7 | 5.2 | 5.3 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 |
| 2 | [illegible] | [illegible] |  | 13.4 | 12.2 | 15.0 | 12.2 | 12.6 | 12.2 | 13.0 | 12.2 | 12.4 | 12.2 | 12.6 | 12.3 | 12.2 | 12.2 | 12.3 | 12.3 |
| 3 | [illegible] | [illegible] |  | 46.3 | 42.3 | 52.1 | 42.3 | 43.6 | 42.2 | 45.0 | 42.2 | 42.9 | 42.2 | 43.8 | 42.2 | 42.4 | 42.1 | 42.5 | 42.3 |
| 4 | [illegible] | [illegible] |  | 77.[illegible] | 70.7 | 87.[illegible] | 70.7 | 73.[illegible] | 70.6 | 75.[illegible] | 70.7 | 71.[illegible] | 70.7 | 72.[illegible] | 70.7 | 70.[illegible] | 70.7 | 71 | 70.7 |
| 5 (pleasure[illegible]) | [illegible] | [illegible] |  | 14[illegible].3 | 135.0 | [redacted] | 135.0 | 13[illegible].5 | 135.0 | 14[illegible].9 | 135.0 | 13[illegible].3 | 135.0 | 13[illegible].4 | 135.0 | 13[illegible].5 | 135.1 | 13[illegible].9 | 135.4 |
| HP Exhaust Pressure |  | 127.8 | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 | [redacted] | 137.2 |
| 6 | [illegible] | [illegible] | [redacted] | 242.5 | 256.8 | 0.6 | 0.6 | 265.9 | 257.2 | 274.3 | 256.9 | 261.7 | 257.5 | 265.8 | 257.3 | 258.4 | 257.7 | 0.6 | 0.6 |
| 7 | [illegible] | [illegible] |  | 663.2 | 602.2 | 0.6 | 0.6 | 635.7 | 614.4 | 656.2 | 614.0 | 625.3 | 615.0 | 0.6 | 0.6 | 604.7 | 603.0 | 580.0 | 576.7 |
| 8 | [illegible] | [illegible] |  | 1134.8 | 1020.3 | 0.6 | 0.6 | 1124.2 | 1045.2 | 0.6 | 0.6 | 1066.1 | 1067.3 | 1012.4 | 990.6 | 1076.6 | 1073.3 | 1067.9 | 1061.7 |

Isolated heaters (0.6) assumed vented

257.6

Comparison of flow/power output/heat added with HP heaters isolated

|  |  | [redacted] | One Heater 5 String Isolated |  | Top 6 heaters isolated |  | One Top Heater Isolated |  | Both top heaters isolated |  | One HP 7 heater isolated |  | Both HP 7 heaters isolated |  | One HP 6 heater isolated |  | Both HP 6 heaters isolated |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling |
| Throttle Flow (Mlbs/h) |  |  | 6.995 | 6.738 | 6.686 | 6.338 | 6.825 | 6.576 | 6.747 | 6.285 | 6.937 | 6.810 | 6.971 | 6.725 | 6.918 | [illegible] | 6.927 | 6.679 |
| Power Output (MW) |  |  | 1013 | [redacted] | 1085 | [redacted] | 991 | [redacted] | 1007 | [redacted] | 979 | [redacted] | 985 | [redacted] | 972 | [redacted] | 971 | [redacted] |
| Heat Rate (Btu per kW h) |  |  | 7821 | 7880 | [illegible] | 8106 | 7728 | 7743 | 7744 | 7747 | 7716 | 7726 | 7746 | 7769 | [illegible] | 7698 | 7707 | 7712 |
| Percentage increase of heat added |  |  | 6.3 | -2.8 | 15.9 | -5.5 | 2.3 | -1.8 | 4.6 | -4.7 | 1.0 | [illegible] | 2.1 | -4.1 | [illegible] | [illegible] | [illegible] | -0.5 |

Flow through each exhaust of LP turbine

|  | [illegible] | [redacted] | One Heater 5 String Isolated |  | Top 6 heaters isolated |  | One Top Heater Isolated |  | Both top heaters isolated |  | One HP 7 heater isolated |  | Both HP 7 heaters isolated |  | One HP 6 heater isolated |  | Both HP 6 heaters isolated |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling | VWO | Throttling |
| Mass Flow (lb/h) | [illegible] |  | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Flow (lb/ft² per hour) | [illegible] |  | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

23rd July 2002 JM

**From:** <robert.brown@power.alstom.com>
**To:** <PHONG-D@ipsc.com>
**Date:** 4/4/03 6:29AM
**Subject:** Heat Balance Diagrams

Kevin (Spires) has asked me if I remember a conversation with you about revising the heat balance diagrams for Intermountain - as a result of changing the capacity of the second unit to be installed (compared to the first one). I have a "vague" recollection that we discussed it, but came to the conclusion that as the heat balance diagrams are based on the nominal 100% flow (of 6.9 Mlb/h) - as is universal practice by all manufacturers - then there would be no difference to show. In practice, of course, the second unit will have a slightly smaller capacity.
Hope this clears up the question.
Regards,
Bob



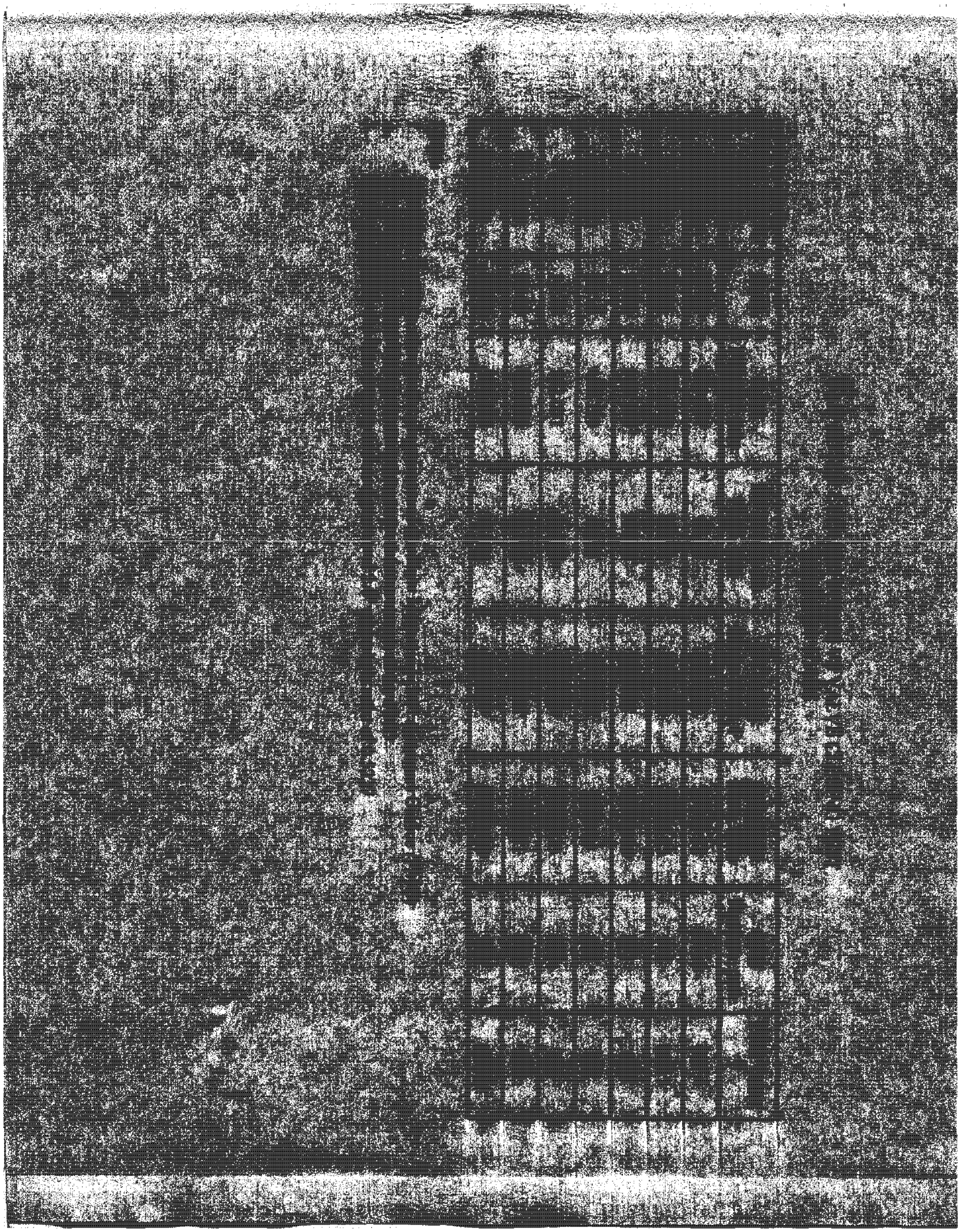
**CC:** <kevin.spires@power.alstom.com>

**From:** <robert.brown@power.alstom.com>
**To:** <PHONG-D@ipsc.com>
**Date:** 4/4/03 6:29AM
**Subject:** Heat Balance Diagrams

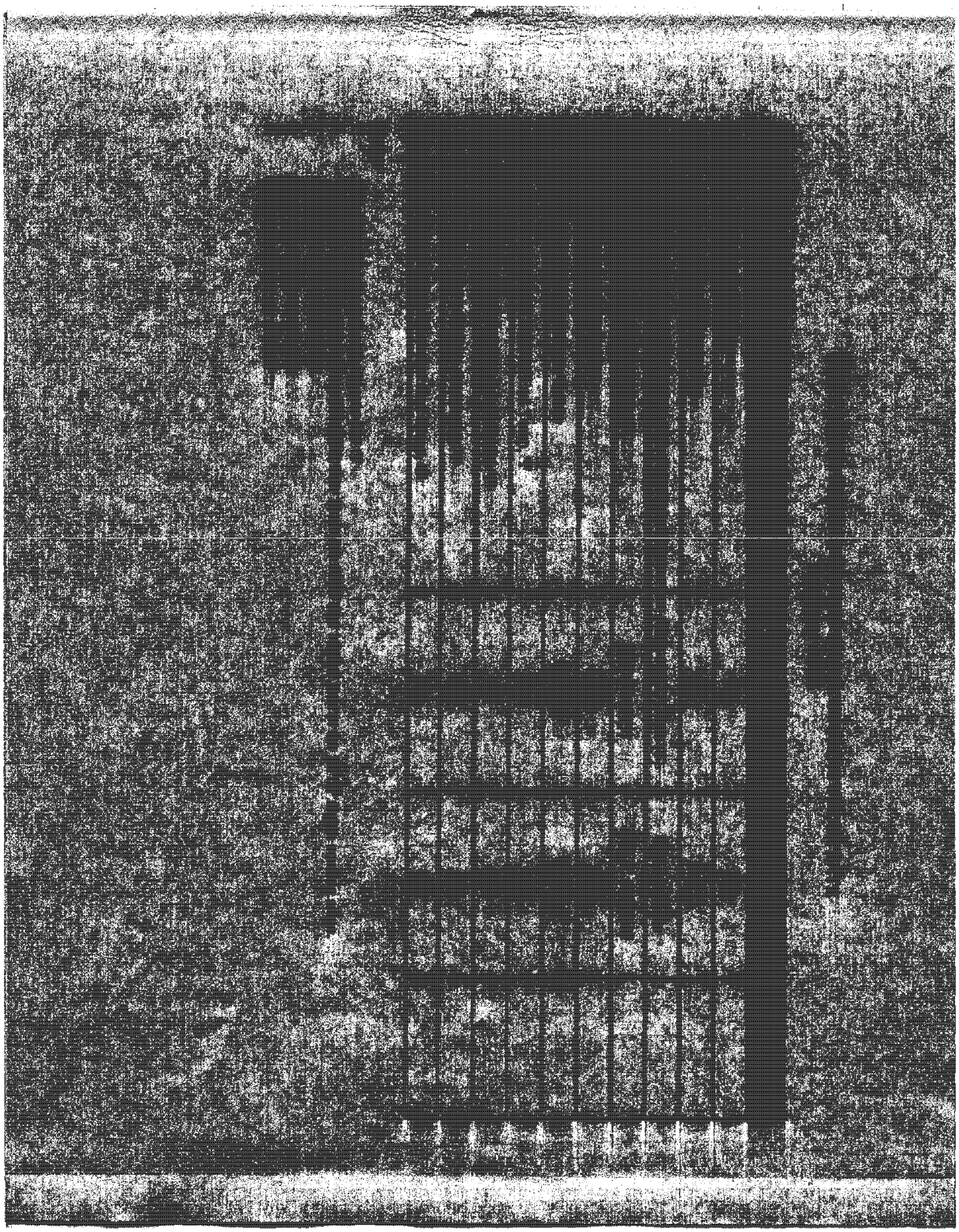
Kevin (Spires) has asked me if I remember a conversation with you about revising the heat balance diagrams for Intermountain - as a result of changing the capacity of the second unit to be installed (compared to the first one). I have a "vague" recollection that we discussed it, but came to the conclusion that as the heat balance diagrams are based on the nominal 100% flow (of 6.9 Mlb/h) - as is universal practice by all manufacturers - then there would be no difference to show. In practice, of course, the second unit will have a slightly smaller capacity.
Hope this clears up the question.
Regards,
Bob



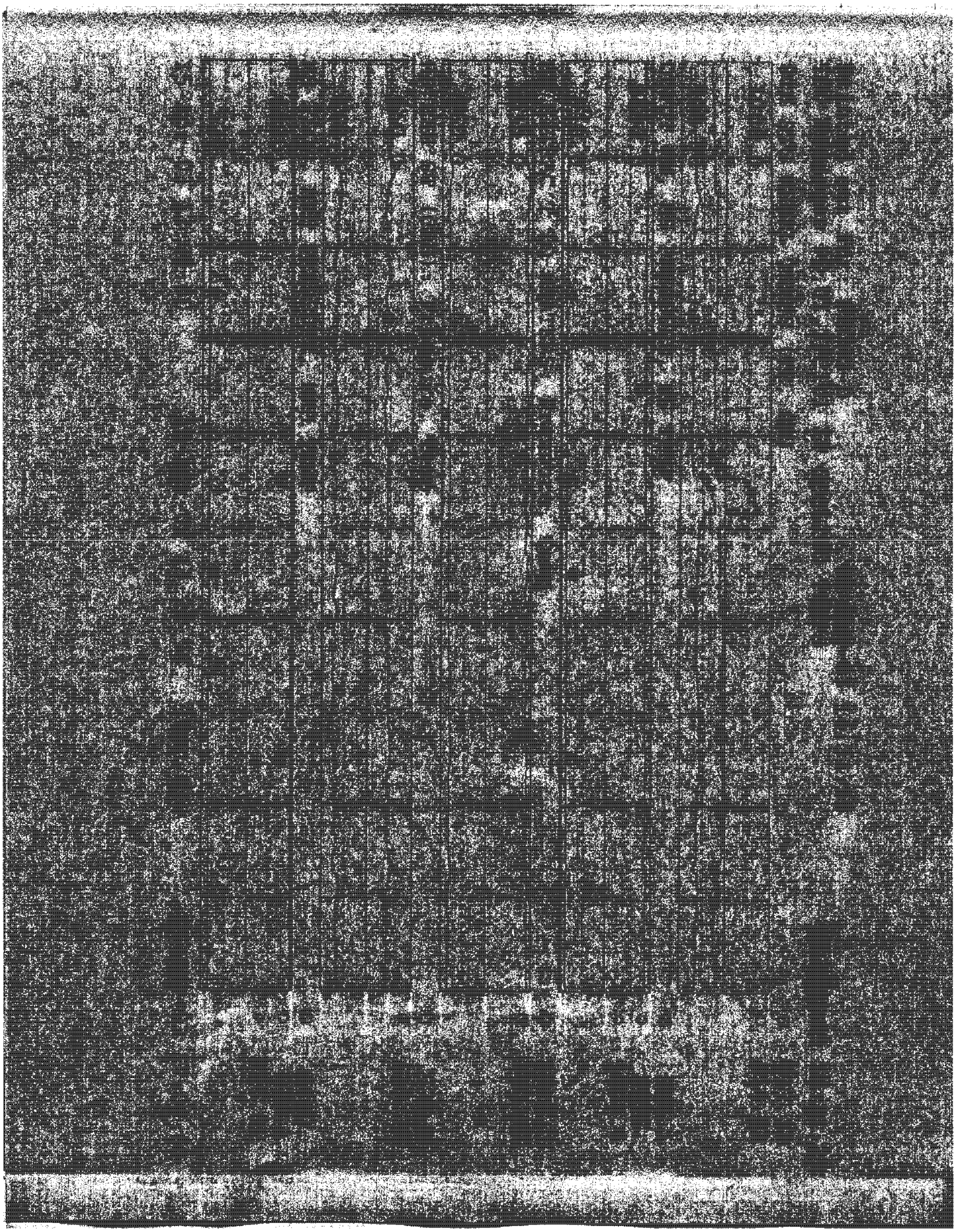
**CC:** <kevin.spires@power.alstom.com>

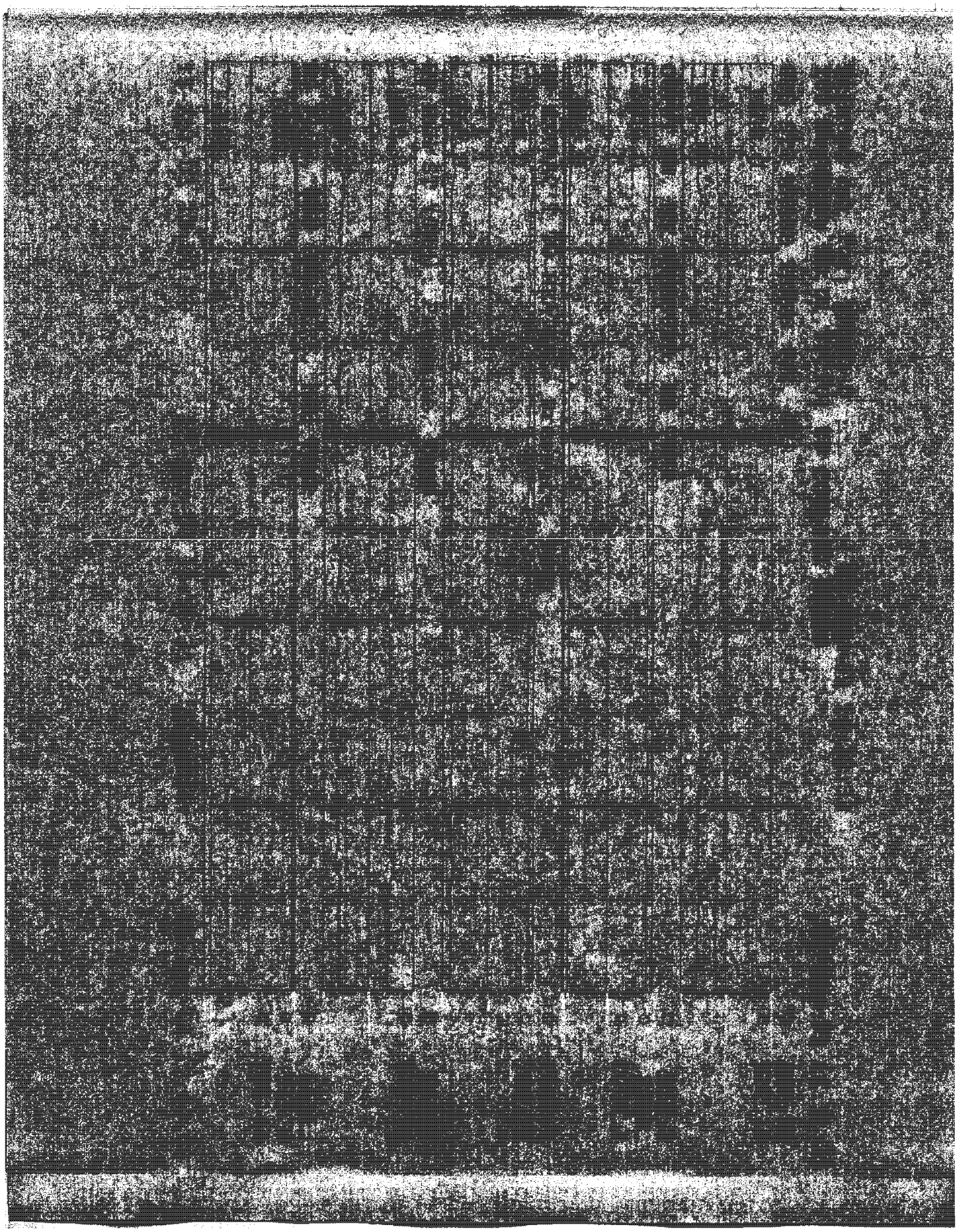


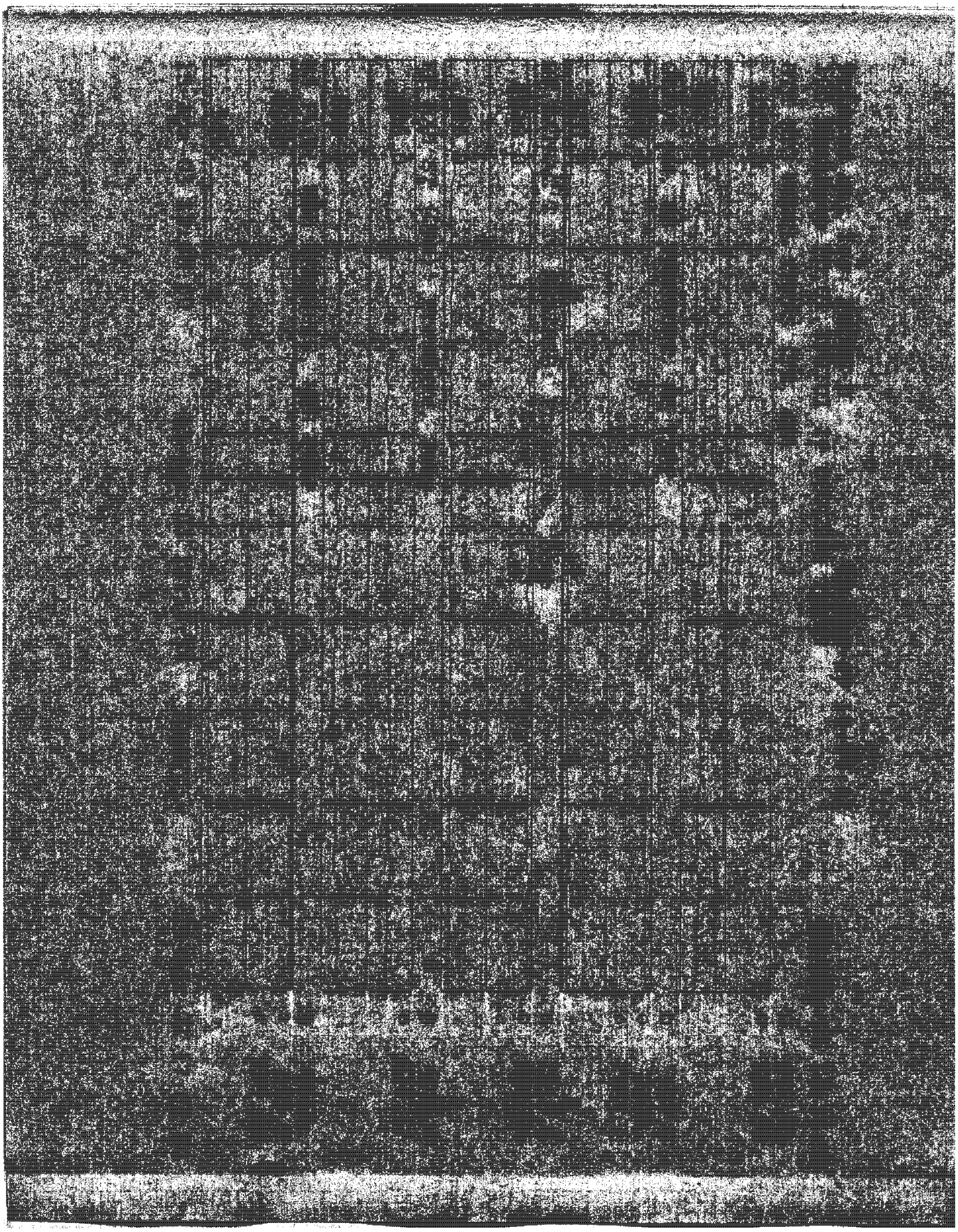
IP7008527



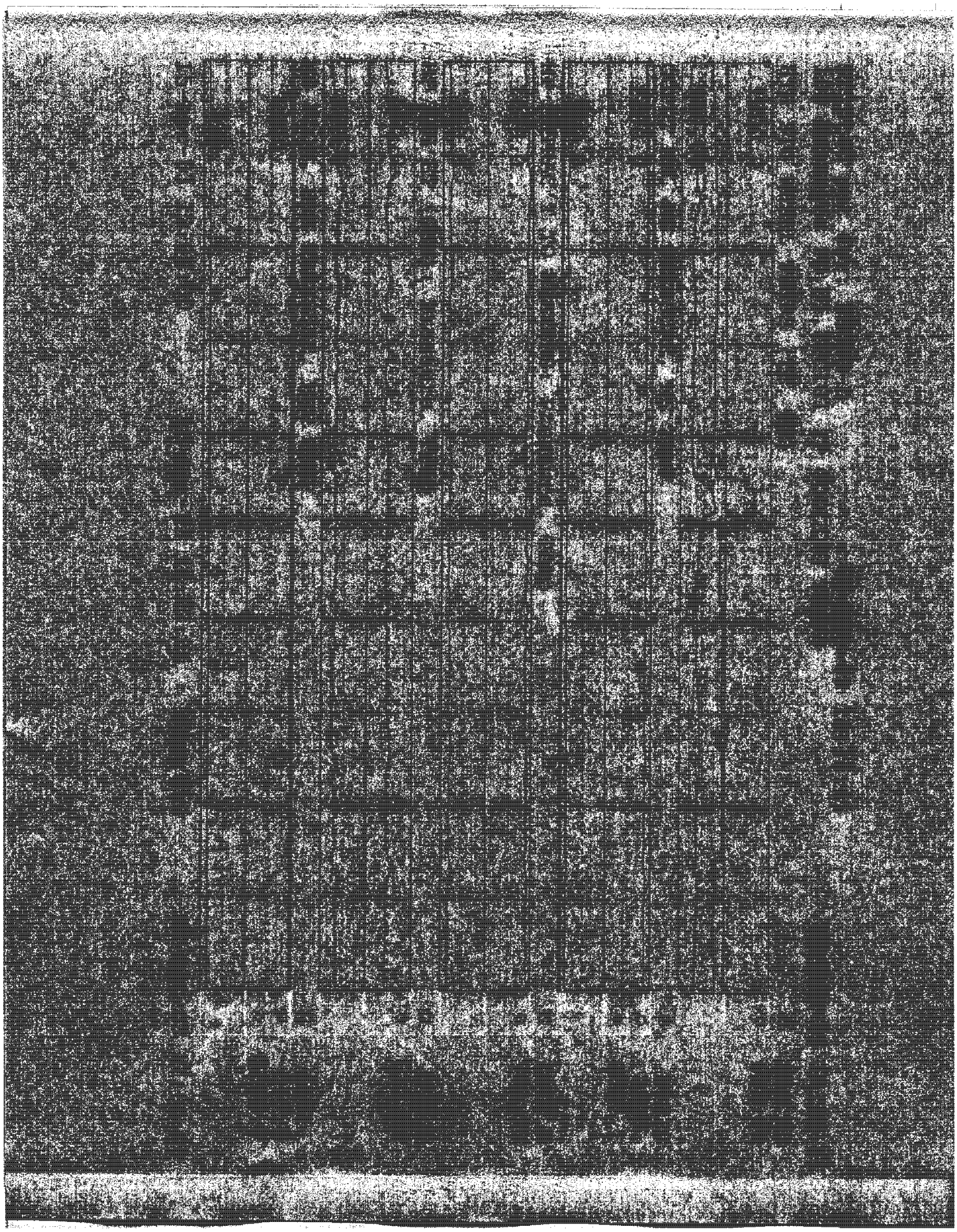
IP7008528



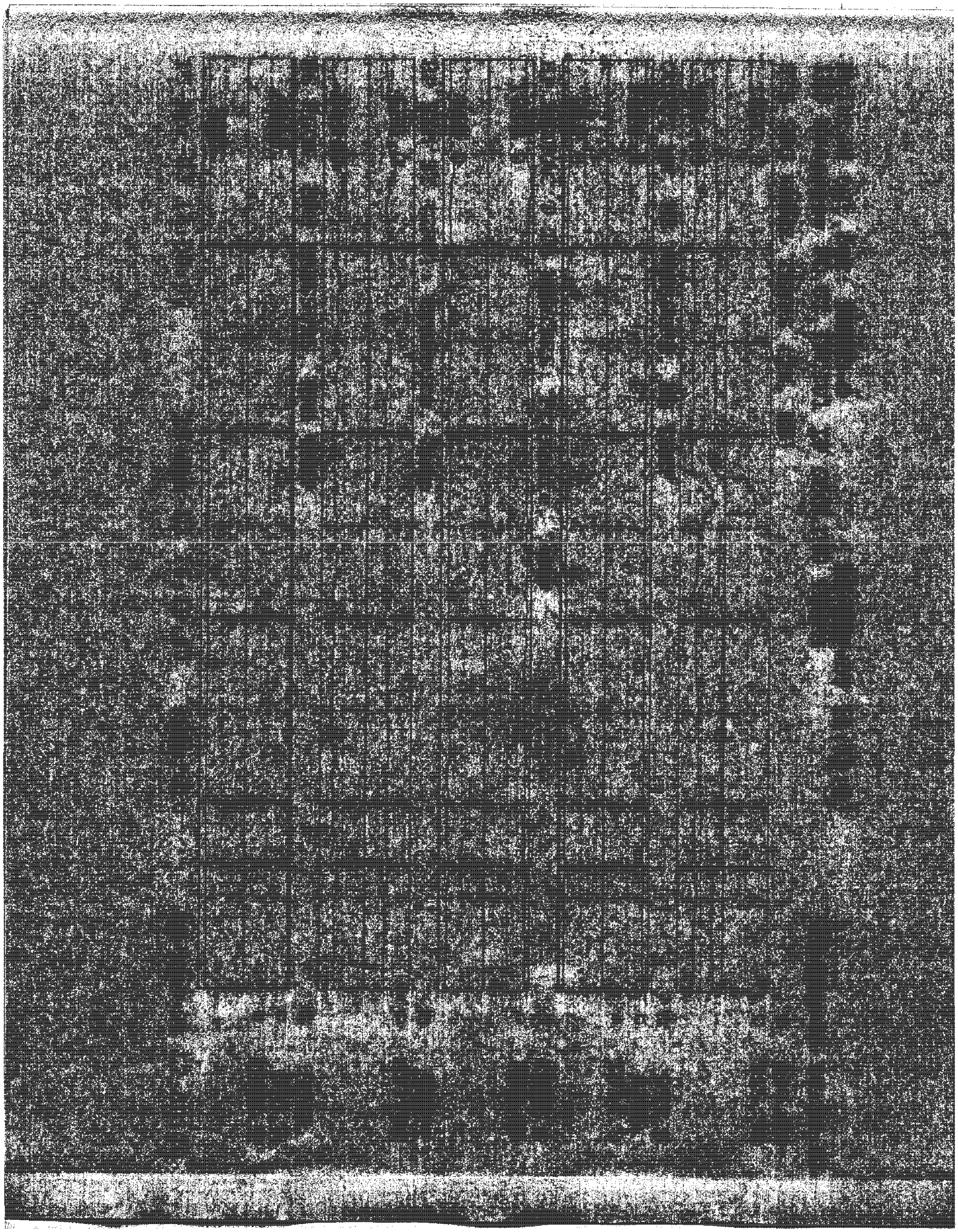




IP7008532



IP7008533



IP7008534

Remote User

# D10112

**DATASET1,5,2,03 (tif)**
**01/05/11 13:58**



**IP7008535**

**IP Cooling Temperature**

INTERMOUNTAIN POWER SERVICE CORPORATION

Unit: 1

Date: 4/28

Prepared by: [signature]

| Time (hrs) | Time uration (hrs) | IP Cooling Temp (in F) | Generating MW OutPut (MW) | 8th Stage, Turbine End Temperature (F) | 8th Stage, Generator End Temp (F) | Main Steam Pressure (psig) | Main Steam Temp (F) | Hot Reheat Pressure (psig) | Hot Reheat Temp (F) |
|---|---|---|---|---|---|---|---|---|---|
| | H | C | D | E | F | G | H | I | J |
| | | Reading | | TE-0080 | TE-0081 | | | | |
| 1045 | 1 | 926 | 917 | 947 | 918 | 2401 | 993 | 535 | 990 |
| 1145 | 2 | 923 | 914 | 941 | 909 | 2387 | 1008 | 532 | 1003 |
| 1245 | 3 | 921 | 916 | 941 | 908 | 2387 | 1007 | 535 | 998 |
| 1345 | 4 | 928 | 917 | 932 | 908 | 2390 | 1007 | 534 | 987 |
| 1440 | 5 | 926 | 918 | 920 | 899 | 2385 | 1011 | 534 | 1000 |
| 1545 | 6 | 924 | 928 | 941 | 907 | 2379 | 1002 | 540 | 999 |
| | | | | | | | | | |

Notes
Data for collums D, E, F, G, H , I and J are reported from PI or control room
Data for collum C are measured and reported from local thermocouple

IP70008536

Submittal #V 6-10-82

IP7008537

481 HB 784

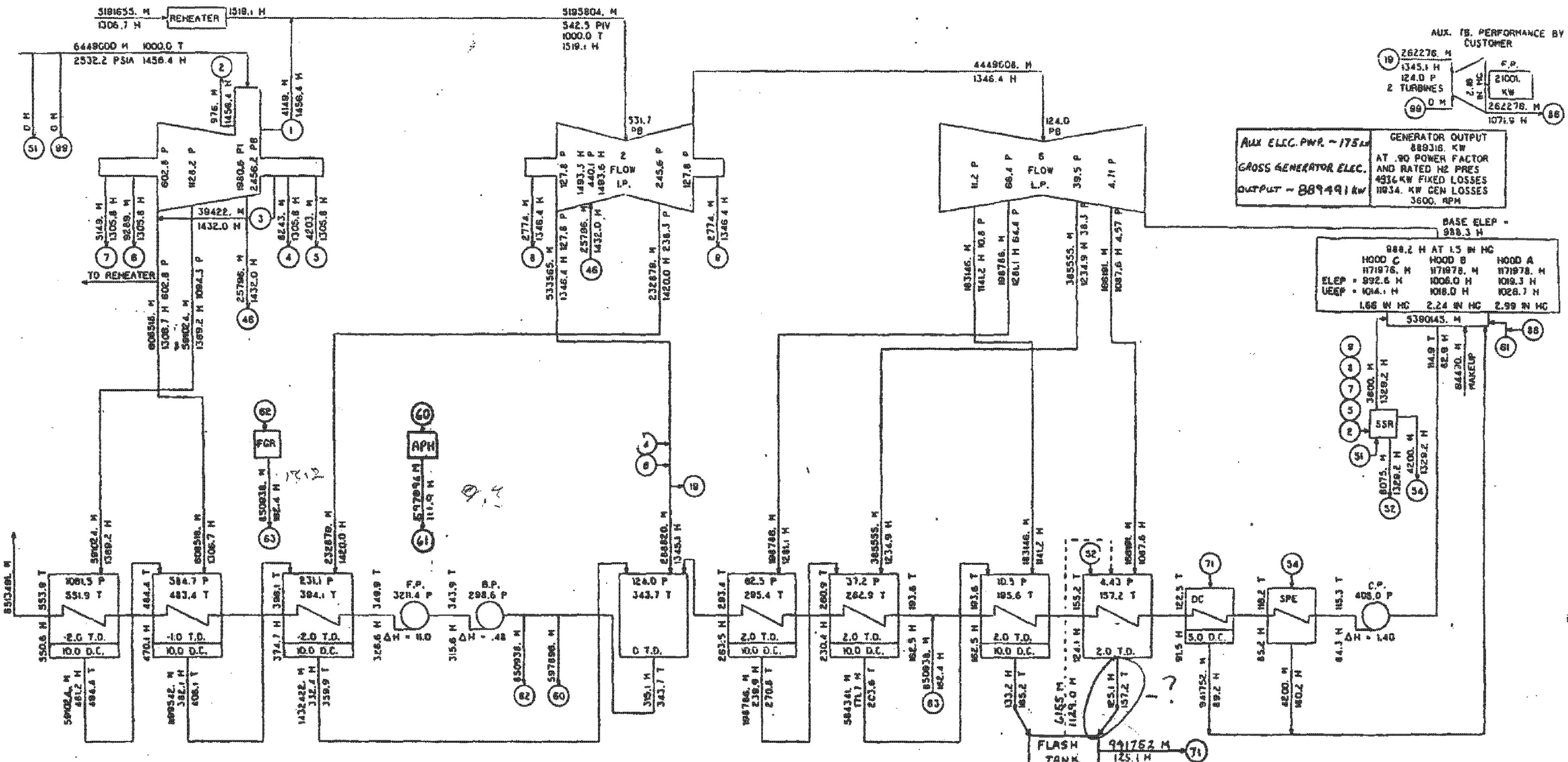
**FOR STUDY PURPOSES ONLY**

TURBINE AND EXTRACTION ARRANGEMENT IS SCHEMATIC ONLY

CALCULATED DATA - NOT GUARANTEED

RATING FLOW IS 583071. H AT INLET STEAM CONDITIONS OF 2412.2 PSIA AND 1000.0 T TO ASSURE THAT THE TURBINE WILL PASS THIS FLOW. CONSIDERING VARIATIONS IN FLOW COEFFICIENTS FROM EXPECTED VALUES, SHOP TOLERANCES ON DRAWING AREAS, ETC. WHICH MAY AFFECT THE FLOW. THE TURBINE IS BEING DESIGNED FOR A DESIGN FLOW (RATING FLOW PLUS 5.0 PERCENT) OF 6122730. H THE EQUIVALENT DESIGN FLOW AT 2532.2 PSIA AND 1000.0 T IS 6449000 H .

THE VALUE OF GENERATOR OUTPUT SHOWN ON THIS HEAT BALANCE IS AFTER ALL POWER FOR EXCITATION AND OTHER TURBINE-GENERATOR AUXILIARIES HAS BEEN DEDUCTED.




VALVE BEST POINT NET HEAT RATE (CUSTOMER'S DEFINITION) = $\frac{6449000(1456.4-550.6)+5191655(1519.1-1306.7)+6513491(.48)+5390145(1.40)+6449(720.5-550.6)}{889316}$ = 7821.7 $\frac{BTU}{KW\text{-}HR}$

LEGEND - CALCULATIONS BASED ON 1967 ASME STEAM TABLES
H - FLOW-LB/HR
P - PRESSURE-PSIA
H - ENTHALPY-BTU/LB
T - TEMPERATURE-F DEGREES

TC6F 30.0 IN. LSB 3600 RPM
2400.0 PSIA 1000. / 1000. F
GEN- 991000. KVA .90 PF LIQ

Keith K Majors

GENERAL ELECTRIC COMPANY, SCHENECTADY N.Y

481 HB 784

6/10/82

VWO 5% OP

U1 IP ROTOR COOLING STEAM VS VALVE CLOSING TEST
Tested Date: 4/15/03

| Valve, SRCV, Position | Time | Static Pressure, psia | DP Across the FMO, psia | IP Cooling Steam Temp, F | Calculated Flow, lb/hr | CRH Pressure, psia | CRH Temp, F |
|---|---|---|---|---|---|---|---|
| Full Open | 13:00 | 523.257 | 59.08 | 857.993 | 29572.22 | 574.5 | 631.4 |
| 3 Turns | 13.25 | 520.509 | 58.76 | 858.346 | 29403.25 | 575 | 629.7 |
| 6 Turns | 13.55 | 519.193 | 55.051 | 858.692 | 28491.16 | 571 | 629 |
| 10 Turns | 14:10 | 459.739 | 4.654 | 857.729 | 8053.04 | 573 | 632 |
| 8 Turns | 14:28 | 502.051 | 40.904 | 860.420 | 24329.23 | 576 | 632 |
| 8.5 Turns | 14:48 | 491.090 | 31.130 | 858.524 | 21138.11 | 578 | 630 |
| 6.5 Turns | 16:19 | 514.293 | 53.161 | 867.944 | 27780.82 | 574 | 637.9 |

Notes:
1. The Static Pressure was measured upstream of the Flow Measuring (2.0" diameter) Orifice (FMO)
2. The IP Cooling Steam Temperature was measured down stream of the FMO and at the exiting thermowell.
3. Flow calculation was based on an orifice diameter of 2.0" and a beta ratio of 0.5227.
4. Test at 950 MW, VWO.